CLAIMS

Therefore, having thus described the invention, at least the following is claimed:

1. A chip-level electronic package comprising:

at least one waveguide having a waveguide core.

2. The chip-level electronic package of claim 1, further comprising:

an air-gap cladding around a portion of one of the waveguide cores.

3. The chip-level electronic package of claim 2, further comprising:

a lead; and

at least one air-gap layer disposed substantially under a portion of the lead.

4. The chip-level electronic package of claim 2, further comprising:

a first sacrificial layer that can be removed to form the air-gap cladding.

5. The chip-level electronic package of claim 3, further comprising:

a second sacrificial layer that can be removed to form at least one of the air-gap layers.

6. The chip-level electronic package of claim 2, further comprising:

a coupling element adjacent to the waveguide core.

7. The chip-level electronic package of claim 1, wherein the waveguide core includes at least one coupling element.

8. The chip-level electronic package of claim 7, wherein the at least one coupling element is a volume grating coupling element.

9. The chip-level electronic package of claim 7, further comprising:

an air-gap cladding around a portion of one of the waveguide cores.

10. The chip-level electronic package of claim 1, further comprising:

a lead, and

at least one air-gap layer disposed substantially under a portion of the lead.

11. The chip-level electronic package of claim 10, further comprising:

a coupling element adjacent to the waveguide core.

12. The chip-level electronic package of claim 1, further comprising:

a first sacrificial layer that can be removed to form an air-gap cladding.

13. The chip-level electronic package of claim 1, further comprising:

a second sacrificial layer that can be removed to form at least one air-gap layer.

14. The chip-level electronic package of claim 1, further comprising:

a coupling element disposed adjacent to the waveguide core.

15. The chip-level electronic package of claim 1, wherein the waveguide core is adjacent to a lower waveguide cladding.

16. A method for fabricating a chip-level electronic package comprising:

forming a waveguide within the wafer-level electronic package, wherein the waveguide includes an air-gap cladding layer.

17. The method of claim 16, further comprising:

(a) providing a substrate having a passivation layer disposed on the substrate;

(b) disposing a waveguide core on a portion of the passivation layer;

(c) disposing a first sacrificial layer onto at least one portion of the passivation layer and the waveguide core;

(d) disposing an overcoat layer onto the passivation layer and the first sacrificial layer; and

(e) removing the first sacrificial layer to define the air-gap cladding layer within the overcoat layer and around a portion of the waveguide core.

18. The method of claim 17, further including:

disposing a second sacrificial layer onto portions of the overcoat layer after (d) and before (e).

19. The method of claim 18, wherein (e) further includes:

removing the second sacrificial layer to define an air-gap layer.

20. The method of claim 17, wherein (c) further includes:

disposing a second sacrificial layer onto portions of the passivation layer.

21. The method of claim 20, wherein (e) further includes:

removing the second sacrificial layer to define an air-gap layer.

22. The method of claim 17, further including:

disposing a optical grating layer adjacent the waveguide core after (b) and before (c).

23. A method for fabricating a wafer-level electronic package comprising:

(a) providing a substrate,

(b) disposing a first overcoat layer onto the substrate;

(c) disposing a lower cladding layer onto a portion of the overcoat layer;

(d) disposing a waveguide core on a portion of the lower cladding layer;

(e) disposing a first sacrificial layer onto at least one portion of the lower cladding layer and the waveguide core;

(f) disposing an second overcoat layer onto the first overcoat layer and the first sacrificial layer; and

(g) removing the first sacrificial layer to define an air-gap cladding layer within the overcoat layer and around a portion of the waveguide core.

24. The method of claim 23, wherein (e) further includes:

disposing a second sacrificial layer onto portions of the first overcoat layer.

25. The method of claim 24, wherein (g) further includes:

removing the second sacrificial layer to define an air-gap layer.

26. The method of claim 23, wherein (b) further includes:

disposing a second sacrificial layer onto portions of the passivation layer.

27. The method of claim 26, wherein (g) further includes:

removing the second sacrificial layer to define an air-gap layer.

28. The method of claim 23, further including:

disposing a optical grating layer adjacent the waveguide core after (d) and before (e).

29. A method of operating a chip-level electronic package comprising:

coupling an optical signal to a waveguide in the wafer-level electronic package; and

communicating the optical signal through the waveguide.

30. The method of claim 29, wherein the waveguide includes at least one waveguide core and an air-gap cladding around a portion of one of the waveguide cores.